Device for Securing Stacks of Sheet-Shaped Materials during a Rotary Movement

Related Applications

The following co-pending and commonly assigned U.S. patent applications relate to and further describe other aspects of the embodiments disclosed in this application and are incorporated by reference in their entirety.

U.S. Patent application filed coincidentally with the present application entitled "An apparatus for Securing Stacks of Sheet-Shaped Materials For Rotary Movement", U.S. application serial number _____, which said application claims the benefit of German application serial number 102 46 077.9 filed 10/02/2002, and which is hereby incorporated by reference in it's entirety.

Field of the Invention

The invention relates to a device for securing stacks of sheet-shaped materials during a rotary movement.

Background

Typically, devices of the type named are used in the print industry to move stacks of sheet-shaped materials that will be bound, or are already bound, from one processing station to the next or to stack them on a tray. It is important is that the sheet-shaped materials in the stack do not lose their alignment with respect to each other since otherwise errors would occur during the outside edge processing of the stack of sheet-shaped materials. Also punched holes for such things as wire comb binding, plastic comb binding or spiral binding, can slip, which leads to later problems when a corresponding binding element is threaded through.

In these cases, the rotation of a stack of sheet-shaped materials is usually especially complicated since the stack of sheet-shaped materials is exposed to torques such that the individual sheet-shaped materials require adequate protection against slipping. Moreover,

turning and transporting stacks of sheet-shaped materials generally have a relatively large space requirement, for a combined movement the space requirement increases still more.

A number of devices for transporting and turning book blocks are known from the state of the art. European Patent Application EP 1 122 198 A2 shows e.g. a turning device for book blocks. In this process, a book block is transported between two endless transport belts that are mounted on a turning unit. As soon as the book block is located completely between the two endless transport belts, the book block is secured in this position, the entire turning device is rotated 180°, the book block is released again and transported further. However, the device shown there is not especially suitable for unbound stacks of sheet-shaped materials since the book block must first go up an incline between two transport bands. In this case, the axis of rotation is parallel to one of the outside edges of the pages of the book block.

The German OLS DD 236 503 A1 shows another conveyor device in which stacks of sheet-shaped materials secured tightly to holding elements are optionally turned 180°. The force of the rotation is provided to the device from a lifting roller that can optionally be connected with a fixed curved rail and be secured at the axis of rotation by way of a lever. The axis of rotation is normal to the plane of the sheet-shaped materials and exhibits a slight deviation from the vertical.

In further processing devices with the most compact construction possible, the space requirement and energy requirement of the individual components play a critical role. A transport device for stacks of sheet-shaped materials or book blocks takes up much space within a device that cannot be used simultaneously by other units within the device, since this may result in a conflict situation between a stack of sheet-shaped materials that is passing by and the transport device holding them unless there is a complicated synchronizing of the units that use the same space within the device part of the time.

European patent EP 790 139 B1 shows another device for transporting and rotating stacks of sheet-shaped materials. In this case, tongs with extended clamping plates mounted on an arm so that they can rotate are disclosed. The tongs swivel a collected stack of sheet-shaped materials from the collecting location from a horizontal position into a vertical

position in the area of a downstream device. Although the stack of sheet-shaped materials is turned 90°, a swiveling movement takes place instead of a simple rotation. The space required for this movement is considerable.

Another device for transporting and rotating stacks of sheet-shaped materials is shown in German OLS DE 100 01 946 A1. This device for book-binding processing of paper stacks has a clamping device with two clamping plates for a stack of paper sheets, whereby the clamping plates are arranged so that they can move in rotation around an axis of rotation and can be slid along a vertical and a horizontal axis. The clamping movement in this process is only carried out by one of the clamping plates, which presses the stack of paper sheets against the other clamping plate.

During the rotation of a stack of sheet-shaped materials, the space required for the transport/ rotation unit also increases. The smallest space requirement is generally needed if the axis of rotation is normal to the surface of the sheet-shaped materials and at a right angle to the transport direction of the stack of sheet-shaped materials. In addition, simultaneously moving the drives as in existing devices of this type is a less advantageous design, since this increases the weight to be moved and thus the forces required for rotation. In addition, it would be advantageous to maintain a uniform alignment of the stack, independently of the stack thickness, in a device that transports the stacks of sheet-shaped materials and binds them.

A device for securing stacks of sheet-shaped materials during a rotary movement would be desirable that requires only a small amount of space and has a relatively simple structure and can apply relatively high holding forces for securing the stack of sheet-shaped materials with a relatively light drive. In addition, an alignment of stacks of sheet-shaped materials of different thickness to the center of the stack thickness is desirable.

Brief Description of the Drawings

Fig. 1 is a basic schematic representation of an embodiment of the device according to the invention.

Fig. 2 is a schematic isometric representation of another embodiment of the device according to the invention.

Fig. 3 is a schematic top view of the embodiment of the device according to the invention from Fig. 2.

Fig. 4 is a schematic representation of a higher-level device for transporting the stack of sheet-shaped materials.

Detailed Description

Fig. 1 shows the overall structure of the device 60 according to the invention. Other generally known drive and/or guide means and cams that are necessary for operating the device are shown only schematically and/or are only described in a general way.

A stack of sheet-shaped materials 1 has a length L and a stack thickness D. The center of gravity of the stack of sheet-shaped materials lies on axis S. The sheet-shaped materials can be cardboard, paper, plastic film or similar printed materials or combinations of such printed materials. In particular, the sheet-shaped materials can have a row of perforations 1a (see Fig. 4) for inserting a suitable binding for brochures or books.

The frame of device 60 according to the invention essentially represents a U-shaped tong body 64. The tong body may consist e.g. of square hollow steel sections. Within the shanks of the U-shaped tong body 64 are mounted clamping jaws 10, 11 so that they can move with clamping jaw guides 16 mounted in clamping jaw guide rods 15. A first clamping jaw 10 has a rocker 12 at a point of rotation, arranged at half the length of clamping jaw 10. The rocker 12 is provided with spring elements 14, 14' for compensating variations in the thickness D of the stack of sheet-shaped materials 1.

Tong body 64 is mounted with an adapter plate 62 on a transport unit of the device 60 according to the invention, the transport unit that is not shown also provides the drive for the rotary movement of the device 60 according to the invention. The drive for clamping jaws 10, 11 comes from a stepper motor 70, that is fastened on the open end of tong body 64. Attachment of stepper motor 70 at the open end of tong body 64 displaces the center

of gravity of device 60 according to the invention far in the direction of clamping jaws 10, 11. The weight of device 60 according to the invention is selected in such a way that the center of gravity of device 60 is located at axis M. A rotation drive 160 rotates the device 60 about axis of rotation M, around which the rotary movement R is carried out. It can be seen that axis M is near the axis S that lies in the center of gravity of the stack of sheet-shaped materials. Device 60 can be rotated a full 360° if necessary. A controller 162 controls the device 60, in particular, motor 70 and rotation drive 60.

The stepper motor 70 drives a first wheel 72 that transfers the drive movement to a worm 80 by way of a first pulley 73, a second wheel 74, a first shaft 75, a third wheel 76, a second pulley 77, a fourth wheel 78 and a second shaft 79. Alternatively this can also involve gears and toothed belts that engage with each other.

The worm 80 drives the worm gear 90. In this process, the worm gear 90 moves somewhat more than 180° beyond both slack points of the worm gear. On the worm gear 90, a worm gear connecting rod 93 is mounted, which is connected to a first spring assembly plate 94. Behind each of the slack points, there are a first locking device 91 and a second locking device 92, into which worm gear connecting rod 93 engages after negotiating the respective slack point. As soon as the worm gear connecting rod 93 is engaged, the stepper motor 70 can be switched off.

The first spring assembly plate 94 can move along spring assembly guide rods 95 and is connected to a second spring assembly plate 97 by way of a plurality of springs 96. The second spring assembly plate 97 has fastening points 100 for each of clamping jaws 10, 11, each of these fastening points being connected with a first lever 102 and transferring the movement of the second spring assembly plate 97 that is also guided with the spring assembly guide rods 95, to the second lever 104 by way of the first lever 102.

The second lever 104 is fastened at two points, on one side by way of tong body connecting rod 106 at a fastening point 107 on the tong body 64, and on the other side with two clamping jaw connecting rods 108 at two fastening points 109 on one of the clamping jaws 10, 11 in such a way that it is movable. Together with lever 104 and tong body 64, the connecting rods 106 form a parallelogram. Together with the second lever

104 and one of the clamping jaws 10, 11, the clamping jaw connecting rods 108 form a second parallelogram. In this way, the lateral movement of the second lever 104 is translated into an opening or closing movement of the clamping jaws 10 and/or 11 that runs essentially parallel to the tong body 64.

The open end of the clamping jaws 10, 11 is braced with the tong body 64 at a fastening point 19 by way of a transverse rod 18 at a fastening point 19'. In fact, because of the transverse rod 18, the clamping jaws 10, 11 describe a slightly circular movement, however this is negligible because of the large radius. The transverse rods 18 provide the required stability of clamping jaws 10, 11 in the open area of the device 60 according to the invention.

Figures 2 and 3 show another embodiment of the device according to the invention. Components that have the same function have the same reference numbers here, especially the clamping jaws 10 and 11. Figures 2 and 3 show the first clamping jaw 10 in the position furthest from the stack of sheet-shaped materials 1, not shown in Figures 2 and 3; the second clamping jaw 11 is in the position of maximum excursion from the center of the device. This serves only for illustration purposes, it is clear to the person skilled in the art that the structure explained in the following does not permit the second clamping jaw 11 to be stressed against the springs 121 unless the roller 113 contacts the cam 111. On the contrary, the structure of the device in this embodiment is also such that the same distance of the two clamping jaws 10, 11 to a fixed center line between clamping jaws 10, 11 is ensured at all times.

As can be seen in Figure 2, a drive 70, such as a stepper motor, is mounted on housing 64. The drive 70 drives two cams 110, 111 with the same axis. In this process, the axis lies on the center line between the two clamping jaws 10, 11. On the first cam 110 there is a first roller 112; on the second cam 111 there is a second roller 113. Cams 110, 111 are the same except that they rotate on the same axis while offset by 180° with respect to each other. Because of this, both rollers 112, 113 have the same excursion during synchronous rotation of the cams 110, 111. In one embodiments, between drive 70 and cams 110, 111 a transmission is connected that is not shown, but is known to the person

skilled in the art, which translates the rotary movement of the drive 70 for cams 110, 111. Independently of stack thickness D of a stack of sheet-shaped materials 1 to be gripped, the drive 70 is continuously operated to saturation so that the drive 70 thus always applies the same torque for clamping. The cams 110, 111 have a curve such that an adaptation of the holding force for clamping jaws 10, 11 to stack thickness D is achieved. Drive 70 and cams 110, 111 are designed such that a holding force of about 160 N or more can be applied for a stack of sheet-shaped materials 1 with stack thickness D of 60 mm. In addition, the curve shape of cams 110, 111 is such that the drive 70 cannot turn the cams 110, 111 beyond 180°.

In order to ensure a symmetrical arrangement of rollers 112, 113 and the tong levers 114, 115 fastened to them, the rollers 112, 113 are assigned to cams 110, 111, with a height offset from each other. Apart from this, the arrangement of the clamping jaws 10, 11 and the components connected to them are mirror symmetrical to the center line between the clamping jaws 10, 11. In this way, simple means are used to ensure that the distance that the clamping jaws 10, 11 travel with respect to each other is about equal.

On the cam side, the tong levers 114, 115 consist of two parallel plates in order to achieve greater stability, especially in the area of the rollers 112, 113. Behind the tong points of rotation 116, 117, by means of which the tong levers 114, 115 are mounted on the housing 64 so that they can rotate, these plates are combined into a single plate, on the end of which the tong levers 114, 115 are mounted about centrally on the clamping jaws 10, 11 at fastening points 118, 119 so that they can rotate. The clamping jaws 10, 11 are each mounted on the housing 64 with tension springs 120, 121 so that they can float. These tension springs 120, 121 also apply the force with which, by way of tong levers 114, 115, the rollers 112, 113 are pressed against the cams 110, 111 both during opening and during closing of clamping jaws 10, 11. The tension springs 120, 121 are mounted at each end of clamping jaws 10, 11 and symmetrically to the fastening point 118, 119 of the tong levers 114, 115 so that during stacking of sheet-shaped materials 1 with parallel pages, the two clamping jaws 10, 11 are also aligned parallel to each other because of the tension springs 120, 121. On the other side, the tension springs 120, 121 are so flexible that variations in thickness that can occur due to uneven toner application on the sheet-

shaped materials, can be compensated without having a negative effect on the holding force of the clamping jaws 10, 11. In this embodiment example, all tension springs 120, 121 have the same characteristic data. Alternatively, different characteristic data of tension springs 120, 121 can also be used if, at the same time, their position with respect to fastening points 118, 119 is changed and/or tong levers 114, 115 that differ from each other are used.

As in the first embodiment, the clamping jaws 10, 11 run loosely on both sides with clamping jaw guides 16 in guide rods 15 in the second embodiment of the device according to the invention, which is shown in Figures 2 and 4. In order to prevent tipping, the clamping jaws are each guided on the closed end of the device with two parallel clamping jaw guides 16 that are at a distance from each other on guide rod 15.

As Figure 2 and Figure 3 show, the second embodiment has an optical sensor 130 on the housing 64, which is in active connection, through openings 132 in clamping jaws, with a sensor element 131 as illustrated/indicated by cone 133. The sensor element here can be a light-sensitive surface or a mirror that can absorb light from an optical sensor 130 or reflect light to it. Alternatively, this can also be an alternative sensor principle known to the person skilled in the art, e.g. ultrasound. Also, the arrangement of the optical sensor 130 and sensor element 131 can deviate from what is shown, e.g. in that the optical sensor 130 and the sensor element 131 are mounted next to each other or the beam can deviate from that indicated by the cone 133, such as with a diagonal beam.

As can be seen in Figure 3, a lug 141 is always in active connection with first cam 110, which depending on the angular position of cam 110 extends entirely or partially or does not extend into an optical sensor 140. The optical sensor sends this information to a higher-level control (not shown) known to the person skilled in the art, which from this information can draw conclusions about the axis position of the drive, especially whether the clamping jaws 10, 11 are in a closed or open position.

Also Figure 3 illustrates a rotation drive 160' which rotates the device 60' wherein the weight of device 60' is selected in such a way that the center of gravity of device 60' is located at axis S', around which the rotary movement R' is carried out. In particular, this

axis S' also corresponds to the axis S' that lies in the center of gravity of the stack of sheet-shaped materials. Device 60' can be rotated a full 360° if necessary. A controller 162' controls the device 60', in particular, motor 70' and rotation drive 60'.

Figure 4 shows a device 1000 in which the device 60 according to the invention is used. The device 1000 is a device with a transport system for stacks of sheet-shaped materials 1, especially a device for binding stacks of sheet-shaped materials 1. Binding may involve glued bindings, spiral bindings, plastic comb bindings or other bindings; binding with a wire comb binding element is especially preferred.

The sheet-shaped materials may already have been prepared for binding. This means that, in the case of a glued binding, the sheet-shaped materials have page edges that are already trimmed and/or roughened and/or notched that form the book spine. In the case of spiral, plastic comb or wire comb binding, the sheet-shaped materials have a row of perforations 1a that are aligned with respect to each other, into which a corresponding binding element can be inserted. Depending on the application, preparatory treatment such as this of the page edges of the sheet-shaped materials or of the stack of sheet-shaped materials 1 may not be carried out until they are within the device 1000.

A stack of sheet-shaped materials 1 is accepted by a first transport unit M1 from a device 900 mounted upstream and transported to the inside of the device 1000. The device 900 mounted upstream can be, in particular, a device for collecting sheet-shaped materials into stacks 1. In an embodiment of the first transport unit M1, this stack of sheet-shaped materials 1 is made available in a vertical alignment. When the transport unit M1 moves in, advantageously the stack of sheet-shaped materials 1 is aligned to its center line with respect to stack thickness D.

Alternatively, the device 1000 can also have an opening 200, through which manual insertion of a stack of sheet-shaped materials 1 is possible. In this case, the first transport unit M1 serves to prevent fanning of the sheet-shaped materials above a vibrating table RT, by means of which the sheet-shaped materials in stack 1 are aligned against a stop that is not shown.

In an embodiment, the first transport unit M1 has a thickness meter, by means of which the stack thickness D of the respective stack of sheet-shaped materials 1 is determined. This information is made available to a higher-level (not shown) which uses this information for purposes such as to request a binding element adjusted to stack thickness D for binding the stack of sheet-shaped materials 1.

A second transport unit M2 transports the stack of sheet-shaped materials 1, aligned centrally with respect to the stack thickness, to a binding unit DE, whereby the stack of sheet-shaped materials 1 is rotated 180° around an axis of rotation that is normal to the sheet-shaped materials and transfers the stack to a third transport unit M3.

In the binding unit DE, the stack of sheet-shaped materials 1 is bound while it is held by the third transport unit M3. After that, the third transport unit M3 transports the stack of sheet-shaped materials 1 to a tray and, to achieve better stack formation, optionally rotates the stack of sheet-shaped materials 1, especially alternating, around an axis of rotation that is parallel to the outside edges of the stack of sheet-shaped materials 1.

In an embodiment of a device according to the invention, the rotation occurs around an axis of rotation that is normal to the plane of the sheet-shaped materials. On one hand, because of this, there are special requirements of the available holding force of the clamping jaws, since the sheet-shaped materials have to be pressed together in the stack in such a way that they do not become disarranged with respect to each other due to their inherent weight. On the other hand, the vertical position of the sheet-shaped materials in the stack, which generally consist of a flexible material e.g. paper, prevents the stack from deforming, i.e. deviating from a shape that is essentially square.

In another embodiment of a device according to the invention, the sheet-shaped materials hang vertically between the clamping jaws. This also represents a special demand on the holding forces of the clamping jaws, since these have to hold the stack of sheet-shaped materials tightly in such a way that the vertical alignment does not lead to a displacement of the sheet-shaped materials with respect to each other.

In another embodiment of a device according to the invention, a device is open on one side and receives the stack of sheet-shaped materials from an upstream processing unit. In order to avoid a lifting of a device, which is demanding mechanically and with regard to energy, a device can move in with clamping jaws open, with the open side to the side of the stack of sheet-shaped materials, in order then to grasp the stack with the clamping jaws. If a device is used to secure the stack of sheet-shaped materials during a 180° rotation, a device can pass the stack of sheet-shaped materials to a downstream unit and in turn move laterally out of the area of the stack without having to change its vertical center of gravity. In a case where a device according to the invention only holds the stack of sheet-shaped materials while a rotation is being carried out and no additional transport movement in a horizontal direction is planned, alternatively a stack of sheet-shaped materials can be moved laterally between the open clamping jaws and after the rotation, be taken out of a device laterally from the other side. In this case, a lifting of the stack of sheet-shaped materials is also not necessary. On one hand, this embodiment represents a considerable demand on the stability of the tongs in order to ensure uniform power distribution along the clamping jaws. On the other hand, a lifting of the stack of sheet-shaped materials during a rotation or a combination of rotation and translation can be achieved simply in that the center of gravity of the stack of sheet-shaped materials is below or above the axis of rotation of a device according to the invention.

In an embodiment of a device according to the invention, the center of gravity of a device essentially coincides with the axis of rotation. The torque necessary for rotating a body around an axis of rotation depends, in addition to the mass of the body, also on the position of the axis of rotation with respect to the center of gravity of the body. In particular, it is minimal if the axis of rotation runs through the center of gravity. Since in this case the axis of rotation coincides with the center of gravity of a device, the torque required for rotation of a device and the stack of sheet-shaped materials is minimal. Advantageously, the loading center of gravity of a device, namely the center of gravity of the stack of sheet-shaped materials, is also in the area of the axis of rotation and especially the axis of rotation goes through the stack of sheet-shaped materials. However, generally the loading masses play only a subordinate role in comparison to the mass of the tongs in a device of this type. Consequently because of this characteristic the required

drive for rotating the loaded or unloaded device can be designed so that it is small and cost-effective. Because of this arrangement, the torque to be applied varies only slightly for different thicknesses of the stack of sheet-shaped materials.

In another embodiment of a device according to the invention, the drive is active only during the closing movement and the opening movement of the first and second clamping jaw. Advantageously the drive is a drive that comes from a stepper motor. In one embodiment, the drive is mounted on the open side of a device in order to achieve weight compensation so that the center of gravity of a device essentially coincides with the center of gravity of the stack of sheet-shaped materials. In another embodiment, the drive is not rotated along with the clamping jaws. In this case, the clamping jaws are first moved by the drive into a closing position, then the clamping jaws are locked in this position, the drive is decoupled from the clamping jaws, the clamping jaws and the stack of sheet-shaped materials is rotated, the drive is coupled in the rotated position again and the clamping jaws are unlocked and opened by the drive again. In this embodiment, the torque to be applied for the rotation is especially low due to the reduced size of a device moved.

Another advantage resulting from the characteristic that the drive is only active during the closing movement and the opening movement of the first and second clamping jaw is that even if there is a power failure, the stack of sheet-shaped materials is held securely between the clamping jaws.

In an alternative embodiment, the drive can also be mounted on the closed side of a device according to the invention. In this case, compensation weights may be necessary on the open side or the axis of rotation will be displaced in the direction of the closed end of a device.

In another embodiment of a device according to the invention, the drive drives a worm gear, whereby the worm gear converts the rotary drive movement into a linear movement. A worm gear is effective for the conversion of the drive into a clamping movement, especially if the clamping movement has its end point in the area of the slack points of the worm gear. In the area of the slack points, the wheel that turns the worm gear carries

out a relatively large number of rotations, but this leads to only a very small lateral movement. Because of this, a drive can apply a relatively high force in the area of the slack points, especially the high holding force required to secure the sheet-shaped materials.

As a continuation of this embodiment, the worm gear advantageously catches, in open and/or in closed state, just behind the slack points. As already indicated above, this measure allows the drive to be decoupled from the clamping jaws so that it may not be necessary to move the drive along with the clamping jaws during the rotary movement. For another thing, it can be ensured that even during a power failure the stack of sheet-shaped materials is securely held between the clamping jaws. Advantageously, the drive of the clamping jaws is stressed less due to this characteristic. Additionally, the tight holding of the sheet-shaped materials during a power failure is also ensured by the self-locking of a gear, e.g. by the worm gear.

In another further development of this embodiment according to the invention, the worm gear prestresses a common spring assembly for moving the clamping jaws. The movement of the common spring assembly operates a series of levers that move the clamping jaws toward each other and away from each other. A common spring assembly for movement of both clamping jaws leads to a uniform distribution of the holding force. Because of the use of a spring assembly with the same regulating distance, stacks of sheet-shaped materials are automatically pressed with more force as the stack thickness increases. This makes sense, since with increasing stack thickness, the danger increases that the sheet-shaped materials in the stack will become disarranged with respect to each other. Therefore, the closing movement of the clamping jaws is advantageously independent of the thickness of the stack of sheet-shaped materials.

In another embodiment according to the invention, one of the clamping jaws has a spring-loaded rocker to compensate variations in thickness within the stack of sheet-shaped materials. Thickness variations of this type can occur if the sheet-shaped materials in the stack are printed differently, i.e. the toner application varies greatly along the clamping jaws. By using a spring-loaded rocker in one of the clamping jaws, it is possible to attain

a holding force that is distributed uniformly along the clamping jaws. In addition, the clamping jaws advantageously have longitudinal guides that ensure an essentially straight-line movement of the clamping jaws. In addition, transverse rods may be provided advantageously for stabilizing the clamping jaws. The transverse rods engage in the open end of the clamping jaws and brace a device with the tong body.

The clamping jaws may extend over the entire length of the sheet-shaped materials, in order to obtain the greatest possible holding surface and thus a holding force that is as uniform as possible along the stack of sheet-shaped materials. In this case, the length of the sheet-shaped materials means the length of the largest sheet-shaped materials to be handled with a device according to the invention. Sheet-shaped materials of smaller dimensions may be clamped between the clamping jaws of a device so that the center of gravity of a stack of smaller-format sheet-shaped materials essentially coincides with the axis of rotation of a device.

In an alternative embodiment of a device according to the invention, the clamping jaws extend over the entire length of the sheet-shaped materials and the transfer of force for moving the clamping jaws is carried out using levers whereby these levers may be mounted so that they can move in the center of the length of the clamping jaws.

Furthermore, the clamping jaws may be mounted by way of tension springs on the ends of the clamping jaws so that they float. In this way, the adaptation to variations in thickness of the stack of sheet-shaped materials along the clamping jaws is achieved. The clamping jaws are each mounted around the individual power transmission point in the center of their length so that they can swivel, in such a way that the tension springs mutually adapt the position of the clamping jaws to the local thickness of the stack of sheet-shaped materials along the clamping jaws to a certain degree.

In another further development of this alternative embodiment of a device according to the invention, the drive is a stepper motor that continuously applies the same torque during clamping, independently of the stack thickness. Because of this, no other control is provided in order to adjust the movement of the drive to the varying stack thickness of different stacks of sheet-shaped materials.

In another embodiment, the drive drives two cams, whereby the cams have a curved surface of a type such that an adaptation of the holding force to the thickness of the stack of sheet-shaped materials is carried out using the pitch of the cams.

In another embodiment of a device according to the invention, a device comprises at least one sensor that determines the position of a device or the presence of a stack of sheet-shaped materials.